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(54) INJECTION MOLDED FORM WITH FINE PATTERN TRANSFERRED IN HIGH
 ACCURACY

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain an injection molded form usable as an optical material with high heat resistance and high moist heat resistance by transferring in high accuracy a fine pattern carved on the inner surface of a mold cavity on a molded form by injection molding.
 SOLUTION: This injection molded form with a fine pattern transferred in high accuracy is obtained by injection molding of a cyclic olefin resin or a thermoplastic resin composition comprising the above cyclic olefin resin and a specific hydrocarbon resin.

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【請求項1】

(A) 環状オレフィン系熱可塑性樹脂、ま

たは (A') 環状オレフィン系熱可塑性樹脂および (B)

ポリスチレン換算重量平均分子量が2000以下で常

温で固体の炭化水素樹脂からなる熱可塑性樹脂組成物を

成形してなる微細なパターンが高精度で転写された射出

成形品、

【請求項2】

環状オレフィン系熱可塑性樹脂が1種以上

の極性基を含有することを特徴とする請求項1に記載

の射出成形品

【発明の詳細な説明】

【0001】

【発明の要する技術分野】

本発明は、主に光字材料等に

用いられる、表面に微細なパターンが高精度で転写（露

光）された射出成形品に関する、詳しくは環状オレフ

ン系熱可塑性樹脂または特定の環状オレフィン系熱可

塑性樹脂組成物を使用することにより、耐熱性、耐溶剤

性、耐酸、耐アルカリ、流動性、高転写する

ことができる、微細なパターンを形成し射出成形により転写させ

るものである、スチレン系樹脂であるいは、

ポリスチレン樹脂などを用いられているが、流動性、高

転写する材料の固定化、高転写する材料の固定化、高

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転写する材料の固定化、高転写する材料の固定化、高

転写する材料の固定化、高転写する材料の固定化、高

性樹脂が1種類以上の極性基を含有することを特徴とす

る上記の射出成形品を提供するものである。

【0005】

【発明の実施の形態】

以下、本発明の熱可塑性樹脂組成

物について詳細に説明する。

<(A) 成分：環状オレフィン系熱可塑性樹脂組成物

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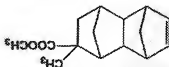
(5) 特開2001-323074

一めらいはノリスを構成する、肥料めらい工法材料を含む塗料を塗布するなどが挙げられる。なお、フィルムシートを構成する場合にその表面に公知の表面処理が施されていても良い。

【0032】ターボ形状は、スロット形状、ピン形状、

(7) 特圖2001-323074

						7 (mmHg) 1 (°C)	
						モ/2-1	モ/2-2
(A-1)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-2)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-3)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-4)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-5)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-6)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-7)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-8)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-9)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200
(A-10)	固相	8-エチル-8-メチルシクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	シクロヘキサン-2-カルボキシ	200	200



【0037】(A-1) 成分の調製方法

下式(1)で表される8-メチル-8-メキシカルボニルプロパシクロ[4.4.0.1^{2,5}.1^{7,10}]-3-ヘキセン(特定単量体)250部と、1-ヘキセン(分子量調節剤)41部と、トルエン(副溶媒)を反応相の溶液を60℃に加熱した。次いで、反応容器内の溶液を750部とを窒素置換した反応容器内に仕込み、液に、トリエチルアルミニウムのトルエン溶液(1.5モル/1)0.62部と、1-ヘキセン/メチル-2-プロパノール/メチル-2-プロパノール/トルエン溶液(濃度0.05モル/1)3.7モル)のトルエン溶液(濃度0.05モル/1)3.7モル)を加し、この系を80℃で3時間加熱攪拌することにより副溶媒反応させて副溶媒を除去した。この副溶媒反応における重合転化率は97%であった。

【0038】

【化2】

【B成分】(B-1)成分
シクロヘキサエン-2-カルボキシ酸 分子量1130、軟化点125℃
【B-2】成分
シクロヘキサエン-2-カルボキシ酸 分子量1130、軟化点125℃
【B-3】成分
シクロヘキサエン-2-カルボキシ酸 分子量1130、軟化点125℃

【0039】このようにして得られた副溶媒溶液400部と、R₂HCl(CO) [P(C₆H₅)₃]溶液に、0.48部を加し、水素ガス圧100kPa/cm²、反応温度165℃の条件下で3時間加熱攪拌することにより水素添加反応させた。得られた反応溶液(水素添加重合体溶液)を冷却した後、水素ガスを放圧した。この重合体溶液(水素添加重合体)の分子量は100である。

・形状-5
1片の長さが15mm、高さ15mmの直角二等片3角柱状のフ
リズAの正方形となる面に、幅1mm、深さ1mm、直径15
μmのフープを形成した。

【0044】試験片の成形方法
下記の試験で使用するサンプルを射出成形にて行った。

成形機は住友重機製作所SC75M-2。成形条件は、樹脂温度260
〜300℃、金型温度80〜140℃。

【0045】本発明の趣旨に従い下記の項目について試
験を行った。

※電圧性
詳細な電圧性を微細形状測定器で測定し、下記の如く形
状別に評価を行った。

・形状-1
◎-深さ方向の直線部電圧性が95%以上

△-深さ方向の直線部電圧性が70%〜85%
×-深さ方向の直線部電圧性が70%未満

・形状-2
◎-直線部短辺側の電圧性が90%以上

△-直線部短辺側の電圧性が80%〜90%
×-直線部短辺側の電圧性が70%〜80%

・形状-3
◎-半球状トップの最長径部における真円度が98%以
上

○-半球状トップの最長径部における真円度が95〜9
8%
△-半球状トップの最長径部における真円度が85〜9
5%
×-半球状トップの最長径部における真円度が85%未
満

・形状-4
◎-V溝両辺の平均の電圧性が90%以上

○-V溝両辺の平均の電圧性が80%〜90%
△-V溝両辺の平均の電圧性が70%〜80%
×-V溝両辺の平均の電圧性が70%未満

・形状-5
○-フープのすれみけが充分に電圧されている。

△-フープの一部にすれみけが見られる。
×-フープの多面電圧が見られる。

【0046】※耐久性
次の2種類の試験を行い、試験後のフープ形状を評価
した。

キオアブ、100℃×500時間放置
・耐熱性
・耐湿性

試験後のサンプルの形状を上記のそれぞれの評価基準に
準じて評価した。

(B-3)成分

C9/シクロペンタシオネ系石油樹脂 分子量81

8、軟化点125℃

(B-4)成分

水素C9系石油樹脂 分子量1590、軟化点100℃

その他樹脂

メタリル樹脂：比重1.19、Tg108℃、MFR

(260℃、10K_g)154

ポリマ-ポネート樹脂：比重1.20、Tg146℃、

MFR(260℃、10K_g)34

【0041】熱可塑性樹脂組成物の調製法

A成分を重合溶媒に所定のB成分を添加・溶解後、大
量のポリマー溶液で攪拌・ポリマーを単離した後造粒

し、ペレットを得た。ポリマーの粘度は、コソノリ
ート型レオメーターにて、260℃における、せん断速
度-滑り速度の関係を、公知のレオロジーモジュール(cro
ssセール)に基づき解析し、せん断速度10(rad/s)の滑
り粘度η₁とせん断速度10000(rad/s)の滑り粘度η₂を求
め、粘度比η₁/η₂を算出した。実施例およ
び比較例に使用したポリマーあるいは組成物の粘度比η₁/η₂を表-2に示した。

【表2】

η ₁ /η ₂	(A-1)	(A-2)	(A-3)	(A-4)	(A-5)	(A-6)	(A-7)	メタリル樹脂	ポリマ-ポネート樹脂	η ₁ /η ₂
260	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300
320	220	230	250	230	350	330	320	100	40	300

【0043】成形品の形状：

・形状-1

100mm×100mm、厚さ1mmの平板であり、四角で平行な
幅、深さ0.5mm、間隔0.5mm×100本のフープを形成し
た。

・形状-2

100mm×100mm、厚さ1mmの平板であり、縦250mm、深さ1
0mmのフリスエスを100本形成した。

・形状-3

100mm×100mm、厚さ1mmの平板であり、半径1.5mmの半
球状のトップが間隔100mmで格子状に100×100個形成し
た。

・形状-4

3mm×3mm、長さ60mmの棒状であり、その1面に幅10mm
高さ15mm長さ3mmのV溝が凸状に500μm間隔で100本形
成した。

*に、耐熱性、耐溶剤性に優れるので、実使用の環境下で
 パターンの形状が変化するかもしれないことがわかる。

【0048】

【表3】

成分	1	2	3	4	5	6	7	8	9	10	11	12
A-1	100	100	100	100	100	100	100	100	100	100	100	100
A-2												
A-3												
A-4												
A-5												
A-6												
A-7												
A-8												
A-9												
A-10												
A-11												
A-12												
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A-98												
A-99												
A-100												

【0047】実施例1～24、比較例1～10
 表3～表一五に示す組成により射出成形体の性能評価
 を行った。これらの比較より、本発明の射出成形体は、
 成形体表面の微細なパターンの転写性に優れるとともに *

【0049】

※ 【表4】

○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
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1051

【発明の効果】本発明の熱可塑性樹脂組成物は、積状水

温度特性)を保持しながら、表面に微細なパターンを転写

した射出成形体を提供することができる。

【0052】

【図面の簡単な説明】

【図1】 本発明の微細なパターンを転写した射出成形

本の例を示す模式図と断面図を示す

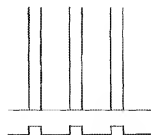
【図2】 本発明の放射線パターンを転写した射出成形

*の図を示す模式図と断面図を示す

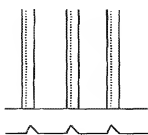
【図3】 本発明の課題を1パターンで解決した事例

本図は、断面図と平面図を示す。

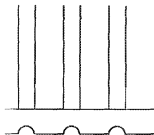
【図4】 本発明の線細なパターンを転写した射出成形木の例を示す模式図それぞれ平面図と断面図を示す。



【例题】



【例2】



【3】

*【図5】 本発明の線維なパターンを転写した射出成形体の例を示す模式図(それぞれ平面図と断面図を示す)

体の例を示す模式図(それぞれ平面図と断面図を示す)

体の例を示す模式図それぞれ平面図と断面図を示す

【図7】 本発明の微細なパターンを転写した射出成形

体の例を示す模式図それぞれ平面図と断面図を示す

【図8】 本発明の図解なパターンを転写した射出成形

体の例を示す模式図、それぞれ平面図と断面図を示す

【図9】 本発明の放射線パターンの形成

体の例をみる機式図と断面図をみる

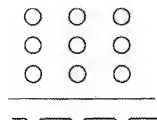
【図10】 本発明の課題なパターンを転写した射出成形品

形体の例を示す幾式図それぞれ平面図と断面図を示す

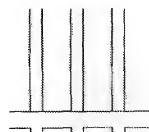
【符号の説明】

点線は、突起部の稜線もしくは溝の底辺を示す

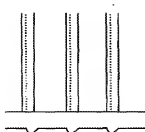
(72)発明者 牛野 卓浩
 東京都中央区築地2丁目11番2号 シエイ
 エスアール株式会社内
 4F071 MA39 MA69 AF45 AF57 AH19
 B005 B003 B004 B006
 AF206 MA12 AF16 AH73 JA07 JB28
 JF01 JQ81
 4J002 BA012 CB001 FD070 GP00



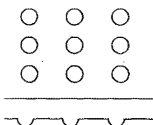
【図10】



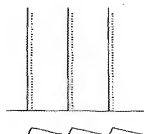
【図7】



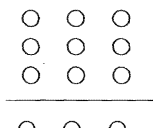
【図8】



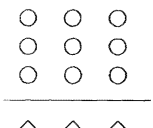
【図9】



【図4】



【図5】



【図6】

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]

[Field of the Invention] In this invention, the pattern detailed on the surface mainly used for an optical material etc. uses cyclic olefin system thermoplastics or a specific cyclic olefin system thermoplastic resin in composition in detail about the injection-molding object transferred with high degree of accuracy (high transfer). Therefore, it excels in heat resistance and resistance to moist heat, and the injection-molding object in which the pattern was transferred with high precision is provided.

[0002]

[Description of the Prior Art] In order to form a detailed pattern in the surface of an optical material conventionally, methods, such as printing using the heat, ultraviolet rays, or electron beam hardening resin in which applies the resist which cuts the surface mechanically and prints a pattern, are adopted. Dramatically, at the allitude, these methods needed complicated processing technology, and by the pattern printing method, a process is complicated and also cutting. There is a thing which forms a detailed pattern in a metallic mold as a method of solving these, and is made to transfer by injection molding. Although methacrylic resin or polycarbonate resin was used for these, balance matching of mobility and a material solidification speed was bad, and it was difficult to high-transfer. These resin had a problem in the dimensional change by heat resistance or water absorption, and there was a problem in adoption to an optical material.

[0003]

[Problem(s) to be Solved by the Invention] Accomplished this invention against the background of the above technical problems, and the purpose, The various characteristics (heat

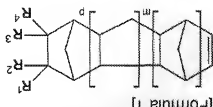
resistance, resistance to moist heat) which cyclic polyolefin system thermoplastics or a cyclic polyolefin system thermoplastic resin composition has are held, and a pattern detailed on the surface usable as an optical material provides the high-transferred injection-molding object.

[0004] [Means for Solving the Problem] This invention (A) cyclic olefin system thermoplastics, Or an injection-molding object in which a detailed pattern in which (A) cyclic olefin system thermoplastics and (B) polystyrene equivalent weight average molecular weight fabricate a thermoplastic resin composition which consists of solid hydrocarbon resin at ordinary temperature or less by 2000 was transferred with high degree of accuracy is provided. This invention provides the above-mentioned injection-molding object, wherein above-mentioned cyclic olefin system thermoplastics contains one or more kinds of polar groups.

[Embodiment of the invention] Hereafter, the thermoplastic resin composition of this invention is explained in detail.

< (A) ingredient: -- (A) ingredient: which constitutes the resin composition of cyclic olefin system thermoplastics > this invention -- as cyclic olefin system thermoplastics (it is described as the (A) ingredient below), the polymer shown in the following -- ** can be mentioned.

** ring breakage copolymer [of the ring-opening-polymerization object ** specific monomer of a monomer (henceforth a "specific monomer" and copolymeric monomer which are expressed with following general formula (I)] ** -- hydrogeneration polymer [of said ring breakage (**) polymer] **, after cyclizing said ring breakage (**) polymer by the Friedel craft reaction, The saturation copolymer of the polymer (**) ** specific monomer and unsaturated double bond content compound which were hydrogenated [0006]



[0007] Among the formula, R¹ - R⁴ are a hydrogen atom, a halogen atom, a hydrocarbon group of the carbon numbers 1-10, or other univalent organic groups, respectively, may be the same respectively or may differ, it may unify and R¹, R² or R³, and R⁴ may form a divalent hydrocarbon group -- it may combine with each other and R¹ or R², R³, or R⁴ may form a monocycle or polycyclic structure, m is 0 or a positive integer and p is 0 or a positive integer.] Cyclic polyolefin system resin obtained from the above-mentioned specific monomer As for [(A) ingredient], it is preferred to contain one or more kinds of polar groups in molecular structure from a viewpoint of raising the processability of injection molding.

[0008]<Specific monomer> as a desirable specific monomer, R¹ and R³ are the hydrocarbon groups of a hydrogen atom or the carbon numbers 1-10 among the above-mentioned general formula (i), R² and R⁴ are the organic groups of a hydrogen atom or monovalence, At least one of R² and the R⁴ shows polar groups other than a hydrogen atom and a hydrocarbon group, m is an integer of 0-3, p is an integer of 0-3, and it can mention that whose m+p is 0-4 (still more preferably 0-2, especially preferably 1). A specific monomer which has a polar group expressed with formula-(CH₂)ⁿ COOR⁵ among specific monomers has a preferred

thermoplastic resin composition obtained at a point used as a high glass transition temperature and a thing which has low hygroscopicity. In the above-mentioned formula concerning a polar group -- R⁵ -- a hydrocarbon group with 1-12 carbon atoms -- it is an alkyl group preferably. Although n is usually 0-5, since glass transition temperature of a thermoplastic resin composition in which a thing which has a small value of n is obtained becomes high, it is desirable, and the composition of a specific monomer whose n is 0 further is preferred at an easy point. In the above-mentioned general formula (i), it is preferred that R¹ or R³ is an alkyl group, and carbon numbers of the alkyl group concerned are 1-4 -- desirable -- further -- desirable -- it is 1 especially preferably. It is preferred to be combined with the same carbon atom as a carbon atom which a polar group especially expressed with formula-(CH₂)ⁿ COOR⁵ of the above [this alkyl group] combined. In general formula (i), a specific monomer whose m is 1 is preferred at a point that a thermoplastic resin composition with a high glass transition temperature is obtained.

[0009]The following compounds are mentioned as an example of a specific monomer expressed with the above-mentioned general formula (i). Bicyclo[2.2.1]hept-2-ene, 5,2,1,0², bicyclo[6³-8-decene, Tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, Pentaicyclo [6.5.1.1³,6.0.2⁷,0⁹,1³]-4-pentadecene, Pentaicyclo [7.4.0.1²,5,1⁹,12.0⁸,1³]-3-pentadecene, Tricyclo [4.4.0.1²,5³-3-undecene, 5-methylbicyclo[2.2.1]hept-2-ene, 5-ethylbicyclo[2.2.1]hept-2-ene, 5-carbomethoxybicyclo[2.2.1]hept-2-ene, 5-methyl-5-carbomethoxybicyclo[2.2.1]hept-2-ene, 5-cyanobicyclo[2.2.1]hept-2-ene, 8-carbomethoxy tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-ethoxycarbonyl tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-isopropoxycarbonyl tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-n-butoxycarbonyl tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-methyl-8-carbomethoxy tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-methyl-8-ethoxycarbonyl tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-methyl-8-n-butoxycarbonyl tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-methyl-8-n-carbopropoxy tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-methyl-8-n-butoxycarbonyl tetracyclo [4.4.0.1²,5,1⁷,10³]-3-dodecen, 8-methyl-8-n-butoxycarbonyl

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[4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen, 8-chloro-8,9-trifluoro tetraacyclo [4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen, 8,9-dichloro-8,9-bis(trifluoromethyl)tetraacyclo [4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen, 8-(2,2,2-trifluoroethoxycarbonyl) tetraacyclo [4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen, 8-methyl-8-(2,2,2-trifluoroethoxycarbonyl) tetraacyclo [4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen etc. can be mentioned. [0010] 8-methyl-8-carbomethoxy tetraacyclo among these specific monomers [4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen, 8-ethylidene tetraacyclo [4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen, 8-ethylidene tetraacyclo [4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen, pentacyclo [7.4.0.1^{2,5}, 1⁹, 12, 0⁸, 1³] At a point that a thermoplastic resin composition obtained eventually becomes the thing excellent in heat resistance, it is desirable and-3-pentadecene is 8-methyl-8-carbomethoxy tetraacyclo especially, [4.4.0.1^{2,5}, 1⁷, 10⁻³-dodecen is preferred from cyclic polyolefin system resin excellent in compatibility with the (B) ingredient being obtained.

[0011] in a ring-opening-polymerization process for obtaining a <copolymeric monomer (A)> ingredient, although ring opening polymerization of the above-mentioned specific monomer may be carried out independently, ring breakage copolymerization of specific monomer concerned and a copolymeric monomer may be carried out. In this case, as an example of a copolymeric monomer used, Cycloolefins, such as cyclobutene, cyclopentene, cyclohepten, cyclooctane, 5,2,1,0² and tricyclo [6]-3-decene, 5-ethylidene-2-norbornene, and a dicyclopentadiene, can be mentioned. As a carbon number of cycloolefin, 4-20 are 5-12 desirable still more preferably. Ring opening polymerization of the specific monomer may be carried out under existence of unsaturation hydrocarbon system polymer etc. which include a double bond between carbon-carbon in main chains, such as polybutadiene, polyisoprene, a styrene butadiene copolymer, an ethylene-non-conjugated diene copolymer, and poly norbornene. And a hydrogenation thing of a ring-opening-polymerization object acquired in this case is useful as a raw material of shock-proof large resin.

[0012] in <ring opening polymerization catalyst> this invention, a ring-opening-polymerization reaction is performed under existence of a metathesis catalyst. At least one sort as which this metathesis catalyst was chosen from a compound of (a) W, Mo, and Re, (b) Deming's periodic table IA group element (for example, Li, Na, K, etc.), IIA group elements (for example, Mg, Ca, aluminum, etc.), such as Cd and Hg, and an IVA group element (for example, Ti, Zr etc. are the compounds of IVB group elements (for example, Si, Sn, Pb, etc.), and it is a catalyst which consists of at least one sort chosen from what has at least one element-carbon to carbon bond concerned or the element-hydrogen bond concerned of combination. In order to improve the activity of a catalyst in this case, the below-mentioned additive agent (c) may be added. [0013] (a) As an example of representation of a compound of W suitable as an ingredient, Mo,

[0014] Let "(a) ingredient:specific monomers" be a range usually set to 1:500-1:5000, and a range preferably set to 1:1000-1:10000 by a mole ratio of the above-mentioned (a) ingredient and a specific monomer as amount of metathesis catalyst used. (a) a rate of an ingredient and the (b) ingredient -- a metal atom ratio -- "(a) : (b)" -- 1:1-1:50 -- it is preferably considered as the range of 1:2-1:30. (a) a rate of an ingredient and the (c) ingredient -- a mole ratio -- "(a) : (a)" -- 0.005:1-1:5:1 -- it is preferably considered as the range of 0.05:1-7:1. [0015] Although polymerization temperature, a kind of catalyst, and a kind of solvent can also perform regulation of a molecular weight of a <molecular weight modifier> ring-opening-polymerization object, in this invention, it is preferred to adjust by making a molecular weight modifier live together in the system of reaction. As a molecular weight modifier suitable here, for example Ethylene, a propene, Alpha olefins and styrene, such as 1-butene, 1-pentene, 1-hexene, 1-heptene, 1-octene, 1-nonene, and 1-decene, can be mentioned, and 1-butene and especially 1-hexene are [among these] preferred. these molecular weight modifiers are independent -- it is -- two or more sorts can be mixed and used. As amount of molecular weight modifier used, 0.005-0.6 mol shall be 0.02-0.5 mol preferably to 1 mol of specific monomers with which a ring-opening-polymerization reaction is presented. [0016] As a solvent (solvent which dissolves a specific monomer, a metathesis catalyst, and a molecular weight modifier) used in a <solvent for ring-opening-polymerization reaction> ring-opening-polymerization reaction, For example, alkanes, such as pentane, hexane, heptane, octane, nonane, and Decan; Cyclohexane, Cycloalkanes, such as cycloheptane, cyclooctane, a decalin, and norbornane; Benzene, Aromatic hydrocarbon, such as toluene, xylene, ethylbenzene, and a cumene; Chlorobutane, Bromine hexane, a methylene chloride, a dichloroethane, hexamethylenedibromide, Compounds, such as halogenated alkane; aryls, such as chlorobenzene, chloroform, and tetrachloroethylene; Ethyl acetate, Saturated-carboxylic-acid ester species, such as n-butyl acetate, acetic acid iso-butyl, methyl propionate, and dimethoxyethane; ether, such as dibutyl ether, a tetrahydrofuran, and dimethoxyethane, can be mentioned, and these are independent, or can be mixed and used. Aromatic hydrocarbon is [among these] preferred. As amount of solvent used, "a solvent:specific monomer (weight ratio)" is made into quantity usually set to 1:1-10:1, and let it be the quantity preferably set to 1:1-5:1.

[0017] Catalysts for hydrogenation Although a ring breakage (**) polymer produced by making it above can also be used as a (A) ingredient as it is, it is preferred to use a hydrogenation (**) polymer by which hydrogenation was carried out as a (A) ingredient. a hydrogenation reaction adds catalysts for hydrogenation to a usual method, i.e., a solution of ring breakage (**) polymer, -- this -- ordinary pressure - 300 atmospheres is performed by making 0-200 ** of 3-200-atmosphere hydrogen gas act at 20-180 **. As catalysts for hydrogenation, what is used for a hydrogenation reaction of the usual olefin nature compound can be used. As these catalysts for hydrogenation, a heterogeneous catalyst and a homogeneous catalyst are publicly known. As a heterogeneous catalyst, a solid catalyst which made carriers, such as carbon, silica, alumina, and a titanla, support precious metal catalyst substances, such as palladium, platinum, nickel, rhodium, and a ruthenium, can be mentioned. As a homogeneous catalyst, naphthenic acid nickel / triethylaluminum, Nickel acetylacetonato / triethylaluminum, octenato cobalt / n-butyl lithium, Titanocene dichloride / diethylaluminum monochloride, acetic acid rhodium, Chlorotris(triphenyl phosphine) rhodium, a dichlorotris(triphenyl phosphine) ruthenium, A chlorohydroxycarbonyltris(triphenyl phosphine) ruthenium, a dichlorocarbonyltris(triphenyl phosphine) ruthenium, etc. can be mentioned. Powder of a catalyst may also be granular. These catalysts for hydrogenation are used at a rate that "ring breakage (**) polymer:catalysts for hydrogenation (weight ratio)" is set to 1:1x10⁻⁶ - 1:2. Thus, by hydrogenation, a hydrogenation (**) polymer obtained becomes what has the outstanding thermal stability, and the characteristic does not deteriorate depending on heating at the time of a fabricating operation and use as a product. A hydrogenation rate is not less than 50% of usually not less than 90% still more preferably not less than 70% preferably here.

[0018] In order to obtain the (A) ingredient which consists of a <unsaturated double bond content compound which constitutes saturation copolymer> saturation copolymer, as an unsaturated double bond content compound with which a copolymerization reaction with a specific monomer is presented, for example, the carbon numbers 2-12, such as ethylene, propylene, and a butene, -- an olefinic compound of 2-8 can be mentioned preferably.

[0019] As a catalyst used for a copolymerization reaction of a <catalyst used when obtaining saturation copolymer> specific monomer, and an unsaturated double bond content compound, a catalyst which consists of a vanadium compound and an organoaluminum compound is used. As a vanadium compound, general formula VO(OR)^a X^b or V(OR)^c X^d (-- however -- R -- a hydrocarbon group -- zero -- a -- a -- three -- zero -- b -- b -- three -- two -- a-b -- a -- three -- zero -- c -- c -- four -- zero -- d -- d -- four -- three -- a-b -- a -- four --) -- expressing -- having -- a vanadium compound -- or -- these -- an electron donor -- an addition -- using -- having. As an electron donor, alcohol, phenols, ketone, aldehyde, Nitrogen-containing electron donors, such as oxygenated electron donors, such as

ester of carboxylic acid, organic acid, or inorganic acid, ether, an acid amide, an acid anhydride, and alkoxyisilane, ammonia, amine, nitril, and isocyanate, etc. are mentioned. At least one sort chosen from what has at least one aluminum carbon combination or an aluminum hydrogen bond as an organoaluminum compound catalyst component is used. a ratio [as opposed to a vanadium atom in a ratio of a catalyst component] (aluminum/V) of aluminum atoms -- two or more -- desirable -- 2-50 -- it is the range of 3-20 especially preferably.

[0020]As a solvent used for a copolymerization reaction of a <solvent used when obtaining saturation copolymer> specific monomer, and an unsaturated double bond content compound, For example, alkanes, such as pentane, hexane, heptane, octane, nonane, and Decan. Aromatic hydrocarbon, such as cycloalkanes, such as cyclohexane and a methylcyclohexane, benzene, toluene, and xylene, and a halogen derivative of those can be mentioned, and cyclohexane is [among these] preferred.

[0021]As for intrinsic viscosity (eta_{inh}) measured in the 30 ** chloroform of the (A) ingredient used by this invention, it is preferred that it is 0.2 - 5.0 dl/g. As a molecular weight of the (A) ingredient, a thing of the range of 20,000-300,000 is preferred for 8,000-100,000, and weight average molecular weight (M_w) for a number average molecular weight (M_n) of polystyrene conversion measured with gel permeation chromatography (GPC).

[0022]With a specific cyclic olefin system thermoplastic resin composition used for <specific cyclic olefin system thermoplastic resin composition> this invention. For example, it is a thermoplastic resin composition containing specific hydrocarbon resin indicated in JP-9-221577 A and a JP, 10-287732 A gazette, and is adding to <(A) ingredients> , < (B) ingredient> :hydrocarbon resin> of a statement is included in the following, and it is **. Such a thermoplastic resin composition has good balance of heat resistance and molding workability. [0023]as hydrocarbon resin of <(B) ingredient> this invention, a polystyrene equivalent weight average molecular weight is a thing of 100-20000 preferably 20000 or less -- further -- desirable -- 200-10000 -- it is a thing of 300-5000 especially preferably. It is a solid thing at ordinary temperature, as an example -- C5 resin, C9 resin, and C5 system / C9 system --

mixed resin and cyclopentadiene system resin. A hydrogeneration thing of polymer system resin of a vinyl substitution aromatic system compound, copolymer system resin of an olefin/vinyl substituted aromatic compound, copolymer system resin of a cyclopentadiene system compound / vinyl substitution aromatic system compound, or said resin, etc. can be mentioned. inside of these -- C5 resin, C9 resin, and C5 system / C -- mixed resin, cyclopentadiene system resin, polymer system resin of a vinyl substitution aromatic system compound, and these mixtures are mentioned 9 system. As C5 resin, an aliphatic series system is preferred, and an alicycle follows system is preferred as C9 resin. Especially as for a desirable thing, C9 resin, cyclopentadiene system resin, and these mixtures are mentioned in

these.

[0024] If a polystyrene equivalent weight average molecular weight of these hydrocarbon system resin is too high, since compatibility with thermoplastic thermoplasticity norbornene system resin which has a polar group will worsen and transparency will decrease, it is not desirable. If a liquefied hydrocarbon compound is used at ordinary temperature, since it will be easy to reduce intensity of resin and bleeding will moreover be carried out on the surface of resin, it is not desirable. A blending ratio of hydrocarbon resin is five to 45 weight section especially preferably two to 50 weight section still more preferably one to 60 weight section preferably [0.1 to 100 weight section] to thermoplastic norbornene system resin 100 weight section. A combination method of a thermoplastic resin composition used for this invention, blending and pelletizing hydrocarbon system resin in a publicly known device used for processing of thermoplastics, for example, a twin screw extruder, a single screw extruder, a continuation kneader, a roll kneading machine, a pressurized kneader, a Banbury mixer, and a solution of norbornene system resin etc. is mentioned.

[0025] In cyclic olefin system thermoplastics or a specific cyclic olefin system thermoplastic resin composition used for an injection-molding object of this invention. Publicly known thermoplastics, thermoplastic elastomer, a gum polymer, organic particulates, inorganic particles, etc. may be blended in the range which furthermore does not spoil transparency and the heat resistance of a constituent.

[0026] An antioxidant publicly known to a resin composition of this invention, for example, 2,6-di-tert-butyl-4-methylphenol, The 2,2'-dioxo 3,3'-di-tert-butyl-5, a 5'-dimethylidyl phenylmethane, Tetakis [methylene-3-(3,5-di-tert-butyl-4-hydroxyphenyl) propionate] methane, it can stabilize by adding an ultraviolet ray absorbent, for example, 2,4-dihydroxybenzophenone, 2-hydroxy-4-methoxybenzophenone, etc. Additive agents, such as lubricant, can also be added in order to raise processability.

[0027] As cyclic olefin system thermoplastics used for this invention, and a specific cyclic olefin system thermoplastic resin composition, 110-200 ° of glass transition temperature (T_g) is still more preferably preferred for a 15-180 ° thing in respect of heat resistance and molding workability preferably. In 260 °, melt viscosity The melt viscosity eta 1 at the time of the shear rate 10 (rad/s), ratios (eta1/eta2) with the melt viscosity eta 2 at the time of the shear rate 1000 (rad/s) are 50-500 -- desirable -- further -- desirable -- 100-450 -- it is 150-400 especially preferably. The transfer nature of a pattern is excellent in it being this within the limits.

[0028] The injection-molding object of this invention can perform fabricating processing to the surface by a publicly known method. By methods, such as PVD and CVD, vapor-deposit an inorganic substance on the surface which performs curing treatment for the surface by an electron beam, ultraviolet rays, etc., and on it For example, acid resisting, an organic compound is applied to the surface which gives functions, such as corrosion resistance and

damage resistance. Applying a paint containing paints or a color which laminates a resin sheet or a film containing cyclic olefin system thermoplastics which gives functions, such as acid resisting, corrosion resistance, and damage resistance, and which laminates a metal thin film etc. is mentioned. When laminating a film sheet, a publicly known surface treatment may be performed to the surface.

[0029] Shape in particular of a Plastic solid of this invention is not limited. As an example of shape, circular or a plate of polygonal shape, a wedge, rod form, a hollow circle, prism, a lens, the shape of a bucket, etc. are mentioned. Shape in particular of a detailed pattern is not limited, either. For example, a slot (a concave, a convex shape, a V type, a semicircle type, a trapezoid type, a prism type) of parallel or the shape of a lattice is 1 or two or more shape to a molded body surface. Multiple pillars, such as many pyramids, such as a hemisphere, a triangular pyramid, and a pyramid, a cone, a rectangular parallelepiped, a pillar, a triangular prism, and a square pole, etc. are the shape of a lattice, or the shape by which multiple arrays were carried out alternately. Shape etc. to which marking, such as a circle, a cross joint, a polygon, and the Kakumaru polygon, was performed are mentioned to a molded body surface. An example of a detailed pattern was shown in drawing 1 - 10.

[0030] Although a size in particular of a detailed pattern is not limited, it is possible to make that the depth and whose width are 0.01-1000 micrometers preferably transfer, and 0.01-500 micrometers of things [further 0.01-100 micrometers of] made to transfer a 0.01-50-micrometer thing are especially suitably possible. As a detailed pattern, when forming two or more patterns, distance between patterns in particular is not limited, but 1000-0.02 micrometer of 100-0.05-micrometer things [500-0.02 micrometer of / 200-0.02 micrometer of] can be applied especially preferably, for example.

[0031] A Plastic solid of this invention is fabricated by injection molding. Form in particular of an injection molding machine is not limited. For example, a method etc. with which an oil pressure controller, an electric servo system, and these combined are held as a direct pressure type, a toggle type, and a drive system as an in-line type, a PURIPURA type, and a mold clamp method as the cylinder mode. Although a detailed pattern is given by metallic mold, a metallic mold is usually manufactured with publicly known steel materials. The surface treatment may be carried out to a cavity side by a publicly known method. A detailed pattern of a metallic mold is formed by methods, such as publicly known cutting, etching, and electrocasting. A detailed pattern may be formed in the movable side [of a metallic mold], fixed side, or both-sides side, and structure accompanied by flexible regions, such as a slide core, may be sufficient as it.

[0032] Publicly known methods, such as what put in a diaphragm, can be used for gate shape in the middle of straight shape, a pin gate, a fan gate, a film gate, a tunnel gate, and a gate. Publicly known methods, such as a broth with pin ejection and a field, can be used for ejection

of mold goods. As a medium for temperature control of a metallic mold, usual water or straight mineral oil etc. can be used. Diccation of resin before shaping is usually performed by a publicly known hot wind type, a dehumidification type, or vacuum type at 80 ° - 120 ° for 4 to 6 hours. A device which makes a plasticization part a vacuum from a viewpoint of prevention, such as hue improvement or a glow of mold goods, like [hopper area] enclosure of inactive gas, such as nitrogen and argon, for example, "ALFIN" currently marketed from Sumitomo Heavy Industries, Ltd., may be used. Although a process condition in particular is not specified, it is usually preferred that a cylinder temperature fabricates 260 ° - 300 °, and a die temperature in the range of glass-transition-temperature T_g-1 ° - T_g-20 ° of cyclic olefin system resin or a specific cyclic olefin system resin composition.

[0033] It can be used for various optical materials which need detailed pattern processing for the surface, such as prism, a lens, a plane lens, a diffraction grating, a light guide plate of an LCD device, a diffusion board, and various light guides, using an injection-molding object of this invention.

[0034]

[Example] Hereafter, this invention is not restricted by these although the example of this invention is described. A "part" shows a "weight section" below.

[0035] The list of A ingredients used for the front light guide plate of A ingredient this invention was shown in table-1. The synthesizing method of an ingredient is illustrated as preparation of A ingredient (A-1). The following (A-2) was manufactured according to (A-1).

[0036]

[Table 1]

種別	部数	217		種別	部数	(A-8)
		210 ¹	216 ¹			
種別	部数	210 ¹	216 ¹	種別	部数	(A-7)
種別	部数	210 ¹	216 ¹	種別	部数	(A-6)
種別	部数	210 ¹	216 ¹	種別	部数	(A-5)
種別	部数	210 ¹	216 ¹	種別	部数	(A-4)
種別	部数	210 ¹	216 ¹	種別	部数	(A-3)
種別	部数	210 ¹	216 ¹	種別	部数	(A-2)
種別	部数	210 ¹	216 ¹	種別	部数	(A-1)

[0037](A-1) 250 copies of 8-methyl-8-carbomethoxy tetracyclo [4.4.0.1^{2,5}.1^{7,10}]-3-dodecen

(specific monomer) expressed with the adjustment method following formula (1) of an

ingredient, it taught in 41 copies of 1-hexenes (molecular weight modifier), and the reaction

vessel which carried out the nitrogen purge of 750 copies of toluene (solvent for a ring-

6

opening-polymerization reaction), and this solution was heated at 60°C in the solution in a

reaction vessel, subsequently, 0.82 copy of toluene solution (1.3 mol/l.) of triethylaluminum

3.7 copies of toluene solutions (concentration of 0.05 mol/l.) of hexachloride tungsten ZrF₆

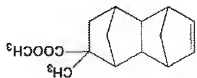
(methanol: t-butanol : tungsten = 0.35 mol : 0.3 mol : 1 mol) which denaturalized with t-

butanol / methanol are added, By carrying out heating stirring of this system at 80 °C for 3

hours, the ring-opening-polymerization reaction was carried out and the ring-opening-

polymerization object solution was obtained. The polymerization conversion in this

but in no case has monomer been found in the polymer. The monomer was found in the polymerization reaction was 97%



[0038]

[Formula 2]

[0039] Thus, 4000 copies of obtained ring-opening-polymerization object solutions are taught to autoclave, 0.48 copy of $\text{RuHCl}(\text{CO})[\text{P}(\text{C}_6\text{H}_5)_3]_3$ was added in this ring-opening-

polymerization object solution, and the hydrogenation reaction was carried out to it by carrying out heating stirring for 3 hours under hydrogen-gas-pressure 100 kg/cm^2 and conditions with a reaction temperature of 165°C . Pressure was discharged into hydrogen gas after cooling the obtained reaction solution (hydrogenation polymer solution). Thus, the hydrogenation rate of the obtained hydrogenation polymer (henceforth an ingredient (A-1)) is 100% on parenchyma. [0040]

[B ingredient] (B-1) ingredient cyclopentadiene vinylaromatic system petroleum resin, the molecular weight 1130 and 125°C of softening temperature ingredient vinylaromatic system petroleum resin The molecular weight 2440 and 140°C of softening temperature ingredient C9-dicyclopentadiene system petroleum resin the molecular weight 818 and 125°C (B-4) of softening temperature ingredient hydrogenation C9 system -- petroleum resin. The molecular weight 1590, the other resin [softening temperature 100°C and] methacrylic-resin: specific gravity 1.19, Tg 108°C , MFR(260 $^\circ\text{C}$, 10 kg) 154 polycarbonate resin: The specific gravity 1.20, Tg 146°C , MFR(260 $^\circ\text{C}$, 10 kg) 34 [0041] After addition / dissolution, B ingredient of the specified quantity was carried to it, after isolating coagulation and polymer with a lot of polymer solutions in the polymerization solution of the preparation A ingredient of a thermoplastic resin composition, and the pellet was obtained. The viscosity ratio of polymer. With a corn plate form rheometer, the relation of the shear-rate-melt viscosity at 260°C , it

table-2.

[0042]

[Table 2]

analyzed based on the publicly known rheology model (cross model), and asked for the melt viscosity eta 1 of the shear rate 10 (rad/s), and the melt viscosity eta 2 of the shear rate 10000 (rad/s), and the viscosity ratios eta 1/eta 2 were computed. The viscosity ratios eta 1/eta 2 of the polymer used for the example and the comparative example or a constituent were shown in

$\eta/10^3$	260
(A-1)	260
(A-3)	220
(A-5)	230
(A-7)	250
メタクリル樹脂	100
ポリブタジエン樹脂	40
(A-2)/(B-1) $\geq 100:35$	320
(A-4)/(B-2) $\geq 100:20$	350
(A-6)/(B-3) $\geq 100:20$	330
(A-8)/(B-4) $\geq 100:20$	320
(A-10)/(B-4) $\geq 100:20$	300

[0043] Shape of mold goods:

- It is shape-1 100mmx100mm and a 1-mm-thick plate, and parallel width, a depth of 0.5 micrometer, and the pattern of 5 micrometers x 100 intervals were formed by the concave micrometer.
- It is shape-2 100mmx100mm and a 1-mm-thick plate, and 100 prism 250 micrometers in width and 10 micrometers in depth was formed.
- It is shape-3 100mmx100mm and a 1-mm-thick plate, and a hemispherical dot 15 micrometers in radius formed in the shape of [100x100] a lattice at intervals of 100 micrometers.
- It is shape-4 3mmx3mm and rod form 60 mm in length, and the V groove with a 10-micrometer length [in height] of 3 mm formed 100 in convex at intervals of 500 micrometers oneth of them. [in width]

- Shape-5 1 piece length formed a mark 1 micrometer in width, a depth of 1 micrometer, and 15 micrometers in diameter in the field used as the square of the piece triangle pole shape of right-angle 2 grade which is 15 mm and 15 mm in height.

[0044] The sample used by the examination of the forming process following of a specimen was performed in injection molding. A making machine is product S made from Sumitomo heavy industrial machine 75M-2. Process conditions are the resin temperature of 260-300 **, and a die temperature of 80-140 **.

[0045] According to the meaning of this invention, it examined about the following item.
 * transfer nature -- detailed transfer nature was measured with the minute shape measuring instrument, and it evaluated according to shape as following.

- The straight part transfer nature of a shape-1 O-depth direction. The straight part transfer nature of a not less than 95% O-depth direction. The straight part transfer nature of 85% - a nature of a not less than 95% O-depth direction. The straight part transfer nature of 70% - a 95% -depth direction. The straight part transfer nature of 70% and a shape-2 O-straight part transfer nature by the side of a not less than 90% O-straight part shorter side. The transfer nature by the side of an 80 to 90% -straight part shorter side. The transfer nature by the side of a 70 to 80% x-straight part shorter side. In the longest diameter part of less than 70% and a

shape-3O-hemispherical dot. The deviation from circular form which can be set, in the longest diameter part of a not less than 98%O-hemispherical dot. The deviation from circular form which can be set, in the longest diameter part of a 95 to 98%*-hemispherical dot. The deviation from circular form which can be set, in the longest diameter part of an 85 to 95%*-deviation from circular form which can be set. In the longest diameter part of an 85 to 95%*-hemispherical dot. The transfer nature of an average of the transfer nature of an average of the transfer nature of an average of the deviation from circular form which can be set of less than 85% and shape-4O-V groove both sides of not less than 90%O-V groove both sides of 80 to 90%*-V groove both sides of 70 to 80%*-V groove both sides does not have a gap of less than 70% and a shape-5O-mark, and is fully transferred.

A gap is seen at a part of *-mark.

The multiple transfer of x-mark is seen.

[0046] endurance -- the following two kinds of examinations were done and the pattern shape

after an examination was evaluated.

the sample after a 500-hour shelf test was evaluated according to each above-mentioned valuation basis in heat-resistant gear oven, 100 °C x 500-hour neglect and moisture-proof heat elevated-temperature constant humidity chamber, and 85 °C x 85RH%.

[0047] The presentation shown in Examples 1-24, comparative example 1 - 10 table-3 - table-5

performed the quality assessment of the injection-molding object. Since the injection-molding

object of this invention exceeds these comparison in heat resistance and resistance to moist

heat while it is excellent in the transfer nature of a pattern with a detailed molded body surface,

it turns out that pattern shape does not change under the environment or actual use.

[0048]
[Table 3]

[illegible]

[Table 4]

[0049]

JP;2001-3230/4,A [DETAILED DESCRIPTION]

[illegible]

[Table 4]

[0049]

[illegible]

[Translation done.]